CLAIMS

What is claimed is:

1. A space-time block decoder for a wireless communications system, comprising:

a demodulator that generates a demodulated symbol sequence by derotating a signal constellation of a received symbol sequence;

a dimension demultiplexer that communicates with said demodulator and that generates in-phase and quadrature components of said demodulated symbol sequence; and

a branch metric computation module that communicates with said dimension demultiplexer and that generates branch metrics based on said in-phase and quadrature components.

2. The space-time block decoder of Claim 1 further comprising:

a Viterbi decoder that communicates with said branch metric computation module and that generates a user data sequence based on said branch metrics.

3. The space-time block decoder of Claim 1 wherein said demodulator derotates said signal constellation by multiplying said received symbol sequence and a conjugate of a channel response of said wireless communications system.

4. The space-time block decoder of Claim 2 wherein said Viterbi decoder generates said user data sequence by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

5. The space-time block decoder of Claim 4 wherein said plurality of path metrics includes possible state transitions that identify a successive symbol in said received symbol sequence.

6. The space-time block decoder of Claim 1 wherein a receiver that communicates with said space-time block decoder includes one receive antenna and a transmitter that communicates with said receiver includes two transmit antennae.

7. The space-time block decoder of Claim 6 wherein said receive antenna receives two symbols during first and second consecutive symbol periods.

8. The space-time block decoder of Claim 1 wherein a receiver that communicates with said space-time block decoder includes at least two receive antennae and a transmitter that communicates with said receiver includes two transmit antennae.

9. The space-time block decoder of Claim 1 wherein a receiver that communicates with said space-time block decoder includes at least two receive antennae and a transmitter that communicates with said receiver includes at least two transmit antennae.

10. The space-time block decoder of Claim 1 wherein at least one symbol in said received symbol sequence is encoded with an orthogonal space-time code.

11. The space-time block decoder of Claim 1 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

12. The space-time block decoder of Claim 1 wherein said space-time block decoder is implemented in a wireless metropolitan area network (WMAN).

13. The space-time block decoder of Claim 1 wherein said space-time block decoder is implemented in a wireless local are network (WLAN).

14. The space-time block decoder of Claim 1 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

15. The space-time block decoder of Claim 14 wherein said branch metric computation module implements bit-by-bit piecewise linear approximation to generate said branch metrics.

16. The space-time block decoder of Claim 15 further comprising:

a deinterleaver that communicates with said branch metric computation module and that generates deinterleaved metrics based on said branch metrics.

17. A receiver for a wireless communications system, comprising:

at least one receiving antenna that receives a received symbol sequence; and

a space-time block decoder that communicates with said at least one receiving antenna, that generates a user data sequence based on said received symbol sequence, and that includes:

a branch metric computation module that generates branch metrics based on in-phase and quadrature components of a demodulated symbol sequence, wherein said demodulated symbol sequence is based on said received symbol sequence.

18. The receiver of Claim 17 wherein said space-time block decoder includes a demodulator that communicates with said at least one receiving antenna and that generates said demodulated symbol sequence by derotating a signal constellation of said received symbol sequence.

19. The receiver of Claim 18 wherein said space-time block decoder includes a dimension demultiplexer that communicates with said demodulator and said branch metric computation module and that generates said in-phase and quadrature components.

20. The receiver of Claim 18 wherein said demodulator derotates said signal constellation by multiplying said received symbol sequence and a conjugate of a channel response of said wireless communications system.

21. The receiver of Claim 17 wherein said space-time block decoder includes a Viterbi decoder that communicates with said branch metric computation module and that generates said user data sequence based on said branch metrics.

22. The receiver of Claim 21 wherein said Viterbi decoder generates said user data sequence by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

23. The receiver of Claim 22 wherein said plurality of path metrics comprises possible state transitions that identify a successive symbol in said received symbol sequence.

24. The receiver of Claim 17 wherein said receiver includes one receive antenna and wherein a transmitter that communicates with said receiver includes two transmit antennae.

25. The receiver of Claim 24 wherein said receive antenna receives two symbols during first and second consecutive symbol periods.

26. The receiver of Claim 17 wherein a transmitter that communicates with said receiver includes two transmit antennae.

27. The receiver of Claim 17 wherein a transmitter that communicates with said receiver includes at least two transmit antennae.

28. The receiver of Claim 17 wherein at least one symbol in said received symbol sequence is encoded with an orthogonal space-time code.

29. The receiver of Claim 18 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

30. The receiver of Claim 17 wherein said receiver is implemented in a wireless metropolitan area network (WMAN).

31. The receiver of Claim 17 wherein said receiver is implemented in a wireless local are network (WLAN).

32. The receiver of Claim 17 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

33. The receiver of Claim 32 wherein said branch metric computation module implements bit-by-bit piecewise linear approximation to generate said branch metrics.

34. The receiver of Claim 33 further comprising a deinterleaver that communicates with said branch metric computation module and that generates deinterleaved metrics based on said branch metrics.

35. A space-time block decoder for a wireless communications system, comprising:

demodulating means for generating a demodulated symbol sequence by derotating a signal constellation of a symbol sequence;

dimension demultiplexing means that communicates with said demodulating means for generating in-phase and quadrature components of said demodulated symbol sequence; and

branch metric computing means that communicates with said dimension demultiplexing means for generating branch metrics based on said in-phase and quadrature components.

36. The space-time block decoder of Claim 35 further comprising:

Viterbi decoding means that communicates with said branch metric computing means for generating user data based on said branch metrics.

37. The space-time block decoder of Claim 35 wherein said demodulating means derotates said signal constellation by multiplying said symbol sequence and a conjugate of a channel response of said wireless communications system.

38. The space-time block decoder of Claim 36 wherein said Viterbi decoding means generates said user data by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

39. The space-time block decoder of Claim 38 wherein said plurality of path metrics includes possible state transitions that identify a successive symbol in said symbol sequence.

40. The space-time block decoder of Claim 35 wherein at least one symbol in said symbol sequence is encoded with an orthogonal space-time code.

41. The space-time block decoder of Claim 35 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

42. The space-time block decoder of Claim 35 wherein said space-time block decoder is implemented in a wireless metropolitan area network (WMAN).

43. The space-time block decoder of Claim 35 wherein said space-time block decoder is implemented in a wireless local are network (WLAN).

44. The space-time block decoder of Claim 35 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

45. The space-time block decoder of Claim 44 wherein said branch metric computing means implements bit-by-bit piecewise linear approximation to generate said branch metrics.

46. The space-time block decoder of Claim 45 further comprising:

deinterleaving means that communicates with said branch metric computing means for generating deinterleaved metrics based on said branch metrics.

47. A receiver for a wireless communications system, comprising:

receiving means for receiving a symbol sequence; and

space-time block decoding means that communicates with said receiving means for generating user data based on said symbol sequence, and that includes:

branch metric computing means for generating branch metrics based on in-phase and quadrature components of a demodulated symbol sequence, wherein said demodulated symbol sequence is based on said symbol sequence.

48. The receiver of Claim 47 wherein said space-time block decoding means includes demodulating means that communicates with said receiving means for generating said demodulated symbol sequence by derotating a signal constellation of said symbol sequence.

49. The receiver of Claim 48 wherein said space-time block decoding means includes dimension demultiplexing means that communicates with said demodulating means and said branch metric computing means for generating said in-phase and quadrature components.

50. The receiver of Claim 48 wherein said demodulating means derotates said signal constellation by multiplying said symbol sequence and a conjugate of a channel response of said wireless communications system.

51. The receiver of Claim 47 wherein said space-time block decoding means includes Viterbi decoding means that communicates with said branch metric computing means for generating said user data based on said branch metrics.

52. The receiver of Claim 51 wherein said Viterbi decoding means generates said user data by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

53. The receiver of Claim 52 wherein said plurality of path metrics comprises possible state transitions that identify a successive symbol in said symbol sequence.

54. The receiver of Claim 47 wherein at least one symbol in said symbol sequence is encoded with an orthogonal space-time code.

55. The receiver of Claim 48 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

56. The receiver of Claim 47 wherein said receiver is implemented in a wireless metropolitan area network (WMAN).

57. The receiver of Claim 47 wherein said receiver is implemented in a wireless local are network (WLAN).

58. The receiver of Claim 47 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

59. The receiver of Claim 58 wherein said branch metric computing means implements bit-by-bit piecewise linear approximation to generate said branch metrics.

60. The receiver of Claim 59 further comprising deinterleaving means that communicates with said branch metric computing means for generating deinterleaved metrics based on said branch metrics.

61. A method for operating a space-time block decoder in a wireless communications system, comprising:

generating a demodulated symbol sequence by derotating a signal constellation of a received symbol sequence;

generating in-phase and quadrature components of said demodulated symbol sequence; and

generating branch metrics based on said in-phase and quadrature components.

62. The method of Claim 61 further comprising generating user data based on said branch metrics.

63. The method of Claim 61 further comprising derotating said signal constellation by multiplying said received symbol sequence and a conjugate of a channel response of said wireless communications system.

64. The method of Claim 62 further comprising generating said user data by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

65. The method of Claim 64 wherein said plurality of path metrics includes possible state transitions that identify a successive symbol in said received symbol sequence.

66. The method of Claim 61 wherein at least one symbol in said received symbol sequence is encoded with an orthogonal space-time code.

67. The method of Claim 61 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

68. The method of Claim 61 wherein said space-time block decoder is implemented in a wireless metropolitan area network (WMAN).

69. The method of Claim 61 wherein said space-time block decoder is implemented in a wireless local are network (WLAN).

70. The method of Claim 61 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

71. The method of Claim 70 further comprising implementing bit-by-bit piecewise linear approximation to generate said branch metrics.

72. The method of Claim 71 further comprising generating deinterleaved metrics based on said branch metrics.

73. A method of operating a receiver for a wireless communications system, comprising:

receiving a symbol sequence; and

generating user data based on said symbol sequence by generating branch metrics based on in-phase and quadrature components of a demodulated symbol sequence,

wherein said demodulated symbol sequence is based on said received symbol sequence.

74. The method of Claim 73 further comprising generating said demodulated symbol sequence by derotating a signal constellation of said received symbol sequence.

75. The method of Claim 74 further comprising derotating said signal constellation by multiplying said received symbol sequence and a conjugate of a channel response of said wireless communications system.

76. The method of Claim 73 further comprising generating said user data based on said branch metrics.

77. The method of Claim 76 further comprising generating said user data by determining a minimum of a plurality of path metrics that comprise accumulations of said branch metrics.

78. The method of Claim 77 wherein said plurality of path metrics comprises possible state transitions that identify a successive symbol in said received symbol sequence.

79. The method of Claim 73 wherein at least one symbol in said symbol sequence is encoded with an orthogonal space-time code.

80. The method of Claim 74 wherein said signal constellation is generated by one of a bi-phase shift keying (BPSK) code, a quadrature phase shift keying (QPSK) code, a 16-quadrature amplitude modulation (QAM) code, a 64-QAM code, and a 256-QAM code.

81. The method of Claim 73 wherein said receiver is implemented in a wireless metropolitan area network (WMAN).

82. The method of Claim 73 wherein said receiver is implemented in a wireless local are network (WLAN).

83. The method of Claim 73 wherein said in-phase and quadrature components comprise Gray coded data that is bit-interleaved.

84. The method of Claim 83 further comprising implementing bit-by-bit piecewise linear approximation to generate said branch metrics.

85. The method of Claim 84 further comprising generating deinterleaved metrics based on said branch metrics.